Special Solar Heat-Radiations and their Earth-felt Effects

THE well-filled lectures on Solar Physics by Prof. Balfour Stewart, published in NATURE, vol. xxiv. pp. 114, 150, will undoubtedly promote the study and assist the understanding of those subjects; and if a single one of the many items alluded to was not quite correctly described, that is neither surprising in itself nor likely to do much harm amidst the wealth of information which was at the same time both correctly stated and neatly conveyed. I should not therefore think myself now called on to notice one exceptional paragraph, but that it contains a most singular mistake in attributing to me conclusions from my own Edinburgh observations that are the very opposite of what I have often published between 1869 and the present time. Nor do I propose to make any positive complaint; for I rather admire the honesty of the lecturer who, after arguing for the more spotted periods of the sun's disk being its occasions of strongest heat evolutions, yet stated voluntarily and against himself that a directly opposite conclusion to his had been deduced by me from the unrivalled collection of more than thirty years of rock-thermometer observations on the Calton Hill. That is to say, that a certain eleven-year heat-wave shown by those thermometers coincided with, not the *maximum*, but the *minimum* spotted state of the sun; subject however to what the lecturer termed "a slight," but in reality a two or three year "lagging behind" the visible solar phenomenon.

Now let the sun, at any short-lived epoch, give forth an extra radiation of heat: I cannot imagine any person attempting or expecting to find its effects, after two or three *years*, as an acutely marked phenomenon in daily air and superficial earth-temperature observations. When therefore a very sharp phenomenon was marked on, or by, our thermometers, I looked for its explanation, not to what had occurred and passed away again several years before, but to something in nearly simultaneous progress on the sun. This something too, which I held forth upon even in my first paper on the subject in 1869 to the Royal Society, was ready at hand as a *vera causa*; and I ventured to describe it as "the ascending node" of the eleven-year sun-spot curve, or the time when a new cycle of sun-spots is not only well begun, but is in the act of its most rapid increase for any part of the cycle; just as a soda-water bottle effervesces most violently immediately after it is uncorked, rather than long afterwards, when some of its slowly-formed last bubbles are quietly escaping, and much more so than when it is not uncorked at all. In a letter too, printed in NATURE not two years ago, I showed how a great part of the solar action might be, and even had been immediate on our thermometers, in consequence of the very first action of a renovated sun, being a dispersion of the ordinary clouds *in situ*, whence an extra amount of direct sunshine on the earth beneath them, producing a dry hot year to the agriculturists there.

The second effects I also showed might be an increased evaporation of distant ocean-surface; the formation thereby and bringing round of greater clouds, heavy rain, and precisely the cold seasons which our Edinburgh thermometers had shown, through thirty years, did generally follow the eleven-year wave of heat. Not, evidently, that the sun was then at a minimum of heat radiation, but that a screen of wet clouds had been drawn between it and that part of the earth where observations were going on.

Now something like this whole sequence of effects has just been experienced in Madeira, all in the course of this week, subsequent to the restored energy of sun-spot manifestation and the earth-answering electric cloud of last Sunday, as I wrote to you next day.

Now that, or the first day after the specified occurrence, proved scorchingly hot, with a blue sky and the maximum shade temperature of the season, thus far.

The second day after, a thick screen of clouds was drawn between us and the sun, while the trade-wind was not only restored on the adjacent sea, but with an excess of violence more like that which is felt about Teneriffe: viz., a more southern, and therefore more sun-governed, island.

But the third day after, not only was the sun again totally invisible on account of cloud, but to the surprise of all Madeira there was a heavy, vertical downpour of rain all day long. Old residents protested that they had never, for ten years at least, known anything of the kind at midsummer season. "Precisely so," I replied; "but in the Cape de Verde Islands still further south, and more under solar dominion than even Teneriffe, you will find that every year, the sun coming to the highest northern declination is marked by heavy tropical rains. Wherefore, if Madeira is now visited in the end of June by Cape de Verde solsticial rains, be assured that the sun is at this moment shining above the clouds over Madeira with much more than his usual annual force."

But though as I write, I would seek to draw the attention of your clever lecturer to unusual solar action being often attended with earth-phenomena which lag behind a few hours only, rather than several years, I do hope he will also obtain a perusal of my paper of 1869 from the Royal Society, Burlington House, London, and take note of the forty or more year cycle, as well as other shorter ones there alluded to; for the standard eleven-year cycle, of which we have now begun a new example, will never be completely definable without knowing on each occasion how far the others are mixed up with it. Thus we had, for instance, in August last year, that eleven-year cycle's *maximum* of temperature which I had pre-announced in print ten years before; but it was very near being lost to observation by occurring not far from the middle of the long-enduring *minimum* of the forty-five years' cycle, whose prime origin is as certainly solar as that of the eleven-year, and even then much shorter cycles of twelve or fifteen days only, of which I have noted several examples since I have been here.

PIAZZI SMYTH,
Astronomer-Royal for Scotland

Jones's Hotel, Quinka do Corvalho,
Funchal, Madeira, July 2

Phenomena of Clouds

THE letter from Prof. Smyth (vol. xxiv. p. 212) recalls to my mind a phenomenon I witnessed several years ago in Arran. I was staying at Strathwhillan, on the north side of Brodick Bay, and looking northward had a full view of Goatfell and Maoldoon. The latter resembles an immense mound heaped up against the eastern side of the former. Snow had recently fallen and coated both. Then a south-easterly wind, coming up and across the firth, caused a cloud to be formed at a considerable elevation above the hills, having its under surface outlined in correct correspondence with the outlining of the subjacent mountains. This contour the cloud retained in seeming fixity for several hours. I attributed its continued existence to the effects of unequal radiation between the cold snow-covered hills and the warmer moisture-laden current above. Whether my surmise was correct, and whether the "central fixity" over Madeira can be referred to the same cause, I leave to the consideration of those more scientifically informed than I.

HENRY MUIRHEAD

Cambuslang, July 8

Early English Pendulum Measures

I FIND in a volume entitled "Metrology, or Weights and Measures of Great Britain and France," by P. Kelly, "Master of the Finsbury Square Academy, London," in 1816, a list of some of the old pendulum experiments of the last century, which contains some indications quite new to me. I am in hopes that if you will allow me space enough to make them known I may perhaps hear where further information is to be found. One of the measurements which he of course mentions is that of Graham. It is rather strange that though every one of the old writers mentions Graham's experiments confidently, I have hitherto failed to find any account whatever of those experiments. The other observers mentioned by Kelly—and so far as I know by him only—are "Emerson," "Desaguillieres" [who always wrote under the name of Desaguliers], "Rotherham," and "Sir Jonas Moore." The mention is not a mere hearsay repetition of their names in this connection, as he gives the *lengths* found by each for London.

In direct connection I may remark that every one knows that the pendulum has been over and over again mentioned and treated as an ultimate appeal in case of failure of other satisfactory means of restoring national standards. In fact its *earliest* use was for this purpose *only*—except of course in horology. Is it not then a strange thing that it was *never*—during the whole of the century and a half which so regarded it—used as a medium of comparison of actual national standards? In Graham's time the relation of the French and English units of measure was so uncertain that the pendulum, with all its failings, was quite competent to establish a firmer one. Newton's table

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of the variation of the seconds' pendulum with latitude was quite trustworthy enough (not to say correct enough) to furnish the geographical difference between London and Paris lengths. Yet as a fact the pendulum never was so appealed to. Yet to this day it is still not uncommonly taught that the pendulum is the proper *natural* standard of reference. In 1816 of course such was the nearly universal dogma.

I say "never," but perhaps one or other of the above observers may be adduced to confute me. J. HERSCHEL

Collingwood, July 11

Faure's Secondary Battery

IN your issue of last week you gave an account of the *soirée* held at King's College, London, on the evening of July 2, and in this account it is stated that "the great event of the evening was the exhibition for the *first* time in England of M. Faure's secondary battery."

At the *soirées* given by the Mayor of Nottingham on the evenings of June 30 and July 3 in connection with the opening of the College by H.R.H. Prince Leopold, I had the pleasure of exhibiting to large audiences one of M. Faure's new batteries. Sheets of lead were bent up into the form of shallow trays, one foot square and one inch deep; in each of these was placed a layer of red lead, then a layer of flannel, then a layer of red lead, and lastly another lead plate. These trays to the number of six were then piled one above the other, after being filled with dilute acid. The cells being connected in series, were polarised by a 10-cell battery of Grove's cells, and after twenty minutes' charging, had taken up a very large quantity of electricity. At a short lecture given during the evening the charged Faure battery was connected with a Gramme machine, and drove it round with considerable velocity for some minutes. After thus employing part of the charge the remainder was used for heating several inches of platinum wire, and for driving for a few seconds a simple form of magneto-electric engine. These experiments amply convinced those present of the practical character of M. Faure's invention. As I have not had the opportunity of examining one of the original batteries of the inventor, I was obliged to make up this experimental form. It is however a convenient form for lecture-room demonstration, as it permits the structure of the battery to be exhibited to an audience. The enormous superiority of M. Faure's cell over the old form of Planté cell is evident at once on experimenting with it. J. A. FLEMING

The University College, Nottingham, July 10

Earthquake in Van

SINCE my former letter I have had an opportunity of visiting the region most affected by the earthquake of May 30, and have obtained some further particulars about it. Its greatest severity seems to have been felt at the Armenian village of Teghourt, lying at the foot of the Nimroud Dagh, at a distance, judging by eye, of not more than four miles from the edge of the crater. This village has been almost entirely destroyed, with the loss of ninety-three lives. By the same shock about 200 houses were thrown down or more or less damaged in the aggregation of hamlets named Akhlat, some six or seven miles further distant from the Nimroud Dagh. Here however happily only two lives were lost and a few persons were injured. On June 9, in the evening, a second shock took place of less violence, which partially damaged a third village, Sipratzor, lying between the other two. As far as I was able to learn these villages were the only localities in which buildings were actually thrown down, though cracks were caused in walls, &c., in other places. The three villages are all in the direct line between the two great extinct volcanoes of the Nimroud Dagh and Sipan Dagh, which fact leads to the conjecture that there may be a line of least resistance joining the two mountains. All three villages, however, are nearer to Nimroud than to Sipan. The greater severity of the shock at Teghourt, the nearest village to Nimroud, may have been due to the latter having been the centre of the disturbance, but it may also have been caused by the fact that the village is built directly upon the solid rock of an ancient lava-bed. The only observation I was able to obtain of the direction of the earthquake wave was communicated to me at a village lying due east of the Nimroud Dagh. Here it was said that the wave came from the south, which would look as if the centre of disturbance were in the Central Kurdistan mountains, not in Nimroud; but one doubtful observation is of course not enough to establish such a point.

Whilst in the neighbourhood I took the opportunity of visiting the Nimroud Dagh. The mountain rises in a very gentle slope, so that it is possible to ride the whole way up and into the crater. The edge of the crater, where we crossed it, is 2810 feet above the Lake of Van by aneroid and about six miles distant from it; some parts of the walls however rise 500 feet or so higher, the most elevated points being to the north and south. The crater is a vast, nearly perfectly circular, hollow, between four and five miles across, the floor of which is an irregular flat dome, partly covered with herbage and partly with dwarf birch and beech and a creeping yew. Among the undulations of the dome, and especially in the depressed ring between the dome and the walls of the crater, are situated some six or seven tarns. One of these, on the margin of which we stopped to rest, is fed by hot springs, which bubble up at numerous points near its edge. I had no thermometer to ascertain the temperature of the water, but I found that one spring, which rose in a small basin almost cut off from the rest of the lake, was just about as hot as I could bear to keep my hand in. This tarn is 880 feet lower than the edge of the crater where we crossed it, this being the lowest point in the whole circuit. I saw no sign of vaporous exhalation, although local tradition has it that the mountain was active not more than four centuries ago; but time did not permit me to explore the whole of the great interior space. EMILIUS CLAYTON

Van, Turkey-in-Asia, June 20

Meteors

SEVERAL splendid meteors having lately been visible, the following observations may be worthy of note in NATURE. I may add that the most brilliant meteor was the one recorded in your columns (vol. xxiv. p. 189).

June 24, 10h. 28m., a very large bright orange-coloured meteor equal to Jupiter appeared near Vega.

At 11h. 29m. a deep orange-coloured meteor, larger and brighter, than Jupiter, crossed the extremity of the comet's tail. It left a short bright streak.

June 25, 10h. 52m., a yellowish-white meteor, as bright as Vega, appeared near ζ Cygni.

At 12h. 4m. a white meteor, as bright as Jupiter, appeared just south of *x* Draconis, and after pursuing a wavy path, disappeared near γ Ursæ Majoris. It left a short streak.

July 3, 10h. 23m. a yellow meteor, nearly as bright as Jupiter, appeared just east of Polaris, travelled slowly in a wavy path, and disappeared north of β Cassiopei.

It will be observed that three out of these five meteors appeared in that part of the sky occupied by the comet, and also that two of them pursued wavy or zig-zag paths. B. J. HOPKINS

79, Marlborough Road, Dalston, E., July 5

The W-Pattern of Paddles

IN your impression of the 2nd ult. allusion is made to the origin of the W pattern which occurs upon paddles from the Solomon Isles. Without illustration it is difficult to understand the transitions which have taken place, but with the objects before you their history is easily read. I therefore inclose sketches; they are all from the same locality. In Fig. 1 it is seen that the swell of the blade of the paddle has suggested the idea of a fish's body, and accordingly the head with the mouth and eyes of a fish have been carved in their proper place. In Fig. 2 the same occurs, except that the blade is bent, probably to adapt the paddle to steering purposes, or for some other object. These two specimens represent the head of a fish in its realistic form. The progress of ornamentation is from realism to conventionalism. By comparing Fig. 3 with the foregoing it is easily seen that the W represents the mouth and sides of a fish's head reduced to straight lines, the eyes having disappeared. In all the specimens in my possession its position is always that in which the true fish's head occurs in the realistic specimens. In Fig. 4 a further change has taken place, the mouth is omitted, and the sides of the head have been brought together in a point, thus forming a simple triangle. Possibly the idea of a fish's head may have been altogether lost in this stage of the ornament, but in the next example, Fig. 5, the idea revives again, as so frequently happens in like cases, without recurring to the original model. Two eyes are seen to be inserted in the place where one occurred in the realistic specimens, the mouth still being deficient.

There can be little doubt, I think, that this interpretation

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